Measurement of Complex Fluid Vapor Pressure by the Gas Saturation Technique – Application to Lubricants

K. Henning
Louis Pasteur Institute
Schiltigheim, France

T.J. Bruno
Physical and Chemical Properties Division
National Institute of Standards and Technology
Boulder, CO 80303 U.S.A.

Fluid vapor pressure is one of the most important fundamental parameters required for the design of nearly all chemical processes. Vapor pressure is also a vital parameter that is required in the modeling of fluid behavior and thermophysical properties. For relatively involatile fluids (and solids), there are only a handful of viable measurement techniques. For mixed fluids, the gas saturation method is usually the only practical option. We have constructed a gas saturation apparatus that is capable of measuring the vapor pressure of six samples simultaneously. In this talk, we will briefly discuss the operational principles of the gas saturation method, and then describe our instrumentation. We will then describe the recent application of this method to the vapor pressure measurement of a family of lubricants. In particular, the lubricants are proposed for use with alternative refrigerants in cooling machinery. For these lubricants, composite and individual component vapor pressures have been determined at several temperatures. These measurements will be described, and the general trends in the data discussed. Finally, correlations of the vapor pressures will be provided.